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SATELLITE GEOLOGICAL AND GEOPHYSICAL REMOTE SENSING OF ICELAND

Richard S. Williams, Jr.  
U. S. Geological Survey  
Reston, Virginia 22090

1 November 1973

Type I Progress Report for Period 1 September 1973 - 31 October 1973

Prepared for:

Goddard Space Flight Center  
Greenbelt, Maryland 20771

(E74-10385) SATELLITE GEOLOGICAL AND  
GEOPHYSICAL REMOTE SENSING OF ICELAND  
Progress Report, 1 Sep. - 31 Oct. 1973  
(Geological Survey, Reston, Va.) 8 p HC  
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Unclas

CSCL 08G G3/13 00385

Publication authorized by the Director, U. S. Geological Survey.

- e. Discussion of significant scientific results and their relationship to practical applications or operational problems including estimates of the cost benefits of any significant results (to be prepared in scientific abstract form of 200 words or less):

ERTS imagery has sufficient resolution to discern altered ground caused by geothermal activity. On MSS color composites the Námafjall geothermal area of north-central Iceland,  $2.5\text{km}^2$  in area, can be clearly mapped.

Rhyolitic rocks in the Torfajökull geothermal area and geothermally altered ground in the Torfajökull and Reykjanes geothermal areas can also be delineated. The fallout pattern of tephra from the 1970 eruption from the volcano Hekla can be mapped where sufficient depth of deposition destroyed the vegetation. Standard NDPF 70mm negatives (3rd generation) were used to print enlargements of the volcanic islands of Surtsey and Heimaey. Sufficient resolution is maintained to directly update maps to the 1:100,000 scale. Low-sun angle imagery ( $<10^\circ$ ) of Iceland has been particularly valuable in mapping new structural and volcanic features hidden beneath glacial ice in Iceland's neovolcanic zone. ERTS-1 imagery has shown the marked differences in volcanic landforms in Iceland from a regional viewpoint. The regional distribution of crater rows, móberg ridges, table (móberg) mountains, calderas, central volcanoes, and shield volcanoes shows striking differences in volcanic geomorphology in different parts of Iceland's neovolcanic zone. [1C, 2D, 3C, 3F, 3I, 3K, 3L (Disaster assessment), 5D, and 10A].

- f. A listing of published articles, and/or papers, pre-prints, in-house reports, abstracts of talks, that were released during the reporting period:

(P) Williams, R. S., Jr., Boðvarsson, Ágúst, Friðriksson, Sturla, Palmason, Guðmundur, Rist, Sigurjón, Sigtryggsson, Hlynur, Sæmundsson, Kristján, Thorarinsson, Sigurður, and Thorsteinsson, Ingvi, 1973, Iceland: Preliminary results of geologic, hydrologic, oceanographic, and agricultural studies with ERTS-1 imagery: in Proceedings of Symposium on Management and Utilization of Remote Sensing Data, American Society of Photogrammetry, Sioux Falls, South Dakota, p. 17-35.

Williams, R. S., Jr., and Palmason, Guðmundur, 1973, Námafjall geothermal area, Iceland: Preliminary analysis of ERTS-1 image #1229-12142: Special Report No. 1 to NASA, Goddard Space Flight Center, Greenbelt, Md., under ERTS-1 experiment SR 651, Satellite Geological and Geophysical Remote Sensing of Iceland, 5 p.

Type I Progress Report  
ERTS-1

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- a. Title: Satellite Geological and Geophysical Remote Sensing of Iceland

ERTS-A Proposal No.: SR 9651

- b. GSFC ID No. of P.I.: IN 079

- c. Statement and explanation of any problems that are impeding the progress of the investigation:

Two problems still persist which impact on the probability of fully carrying out all of the proposed ten experiment objectives. The first problem is the infrequent coverage of Iceland and the usual cloudiness which preclude anything but sporadic coverage of Iceland. This is the result of tape recorder limitations, priorities assigned to other test sites, and command-and-control limitations of the spacecraft. Even with these limitations NDPF has done a superb job in data acquisition over Iceland. The second problem is the lack of ERTS data of Iceland during the spring and early summer months (March, April, May and June) because of tape recorder problems during that period. Several of the experiments (e.g., change in snowcover, vegetation growth, river flooding, etc.) are lacking data during this time of year, when many aspects of the environment are undergoing dynamic environmental change.

- d. Discussion of the accomplishments during the reporting period and those planned for the next reporting period:

(1) Much of the reporting period was devoted to the preparation of research findings for the special review of the status of experiments for each ERTS-1 investigator. The half-hour presentation for the Iceland experiment was presented to NASA on 24 October 1973.

(2) Two days were spent at Johnson Space Center, Houston, Texas, reviewing all of the color and color infrared aerial photography and aerial thermography of Iceland which was acquired in August 1973. Analysis of the aerial data will be incorporated into the analysis of ERTS imagery later in the project.

(3) A presentation on the initial results of the ERTS experiment in Iceland was made before the National Academy of Sciences' Committee on Polar Research.

(4) Additional ERTS-1 imagery of Iceland, which was acquired since the summer of 1973 will be catalogued and studied. Preparation of a paper for the Geological Society of America Annual Meetings will be accomplished.

### Presentations

Williams, R. S., Jr., 1973, Potential usefulness of satellite imagery for the study of rift zones, with particular reference to Iceland: Meeting of Inter-Union Commission of Geodynamics, Rpt. of Working Group 4 Meeting, Session on Reviews of State of Knowledge Regarding Iceland and Neighborhood, Reykjavik, Iceland, 16 July.

Williams, R. S., Jr., 1973, Interim results from ERTS-1 experiment, "Satellite geological and geophysical remote sensing of Iceland:" Report presented to the Geology Review Panel of NASA's Goddard Space Flight Center, Greenbelt, Maryland, 24 October.

Williams, R. S., Jr., 1973, USGS Iceland imagery survey: Lecture presented to Committee on Polar Research, National Academy of Sciences (NRC), as one of 7 papers on "ERTS Imagery in Arctic Regions," Boulder, Colorado, 26 October.

Williams, R. S., Jr., Boðvarsson, Ágúst, Friðriksson, Sturla, Pálmason, Guðmundur, Rist, Sigurjón, Sigtryggsson, Hlynur, Samundsson, Kristján, Thorarinsson, Sigurður, and Thorsteinsson, Ingvi, 1973, Iceland: Preliminary results of geologic, hydrologic, oceanographic, and agricultural studies with ERTS-1 imagery: Symposium on Management and Utilization of Remote Sensing Data, American Society of Photogrammetry, Sioux Falls, South Dakota, 30 October.

- g. Recommendation concerning practical changes in operations, additional investigative effort, correlation of effort and/or results as related to maximum utilization of the ERTS system:

One of the best ERTS images of Iceland was acquired in mid-winter, when the ground was snow-covered, and the sun angle was 7°. Subtle details of geologic structure and volcanic landforms, both within and outside the margins of icecaps, were revealed. NASA should give strong consideration to acquiring ERTS imagery, under low sun angle conditions (down to 5° or even less) at high latitudes. Either mid-winter or on an ascending (evening) orbit during mid-summer (1 June to 1 August) in Iceland would produce low-sun angle imagery of great value to structural and geomorphic studies.

- h. A listing by date of any changes in Standing Order Forms:

N/A

- i. ERTS Image Descriptor Forms:

Three forms provided as attachment to this report.

- j. Listing by date of any changed Data Request Forms submitted to Goddard Space Flight Center/NDPF during the reporting period:

N/A

# ERTIS IMAGE DESCRIPTOR FORM

(See Instructions on Back)

DATE 1 November 1973

PRINCIPAL INVESTIGATOR Richard S. Williams, Jr.

GSFC IN 079

ORGANIZATION U. S. Geological Survey

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ID \_\_\_\_\_

PRODUCT ID (INCLUDE BAND AND PRODUCT)	FREQUENTLY USED DESCRIPTORS*			DESCRIPTORS
1372-12080-4				EEO Active Glacier
1372-12080-5				Advancing Shoreline
1372-12080-7				EEO Braided Streams
				Lake
				Cinder Cone
				Coast
				Coastal Plain
				Coastline
				Crater
				EEO Lateral Moraines
				EEO End Moraines
				EEO Medial Moraines
				Fault
				Lava
				EEO Glacier
				Littoral Drift
				Maar
				Moraine
				Nunatak
				EEO Outwash Plain
				Sediment
				Snow
				Vegetation
				Volcano
				Bay
				Baymouth Bar
				Cape
				Cartography
				Desert
				Grassland
				Highway
				Lagoon
				Morainial Lake

\*FOR DESCRIPTORS WHICH WILL OCCUR FREQUENTLY, WRITE THE DESCRIPTOR TERMS IN THESE COLUMN HEADING SPACES NOW AND USE A CHECK (✓) MARK IN THE APPROPRIATE PRODUCT ID LINES. (FOR OTHER DESCRIPTORS, WRITE THE TERM UNDER THE DESCRIPTORS COLUMN).

MAIL TO NDPF USER SERVICES  
 CODE 563  
 BLDG 23 ROOM E413  
 NASA GSFC  
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PRODUCT ID (INCLUDE BAND AND PRODUCT)	FREQUENTLY USED DESCRIPTORS*			DESCRIPTORS
1372-12080-B				Rangeland
				Forest
				Littoral Drift
				Pasture
				Sediment
				Vegetation
				Reclamation Test Plot
				Glacier Margin Lakes
1372-12074-5				Active glacier (surging)
1372-12074-7				Caldera
				Cartography
				Crater
				Medial Moraine
				Glacier
				Grassland
				Lake
				Moraine
				Mountain
				Outwash Plain
				River
				Sediment
				Snow
				Snow Pack
				Vegetation
				Volcano
				Desert
				Island
				Lava
1372-12074-B				Rangeland

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**ERIS IMAGE DESCRIPTION FORM**  
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PRODUCT ID (INCLUDE BAND AND PRODUCT)	FREQUENTLY USED DESCRIPTORS*			DESCRIPTORS
1372-12083-4 1372-12083-5 1372-12083-7				EEO Active Glacier Advancing Shoreline Braided Stream EEO Caldera EEO Lateral Moraines Coast Coastal Plain Coastline Crater End Moraine Grassland EEO Glacier Cartography Cape EEO Moraine EEO Outwash Plain Snow Lake Maar Moraine Nunatak Sediment Vegetation Bay Baymouth Bar Highway Rangeland Forest Littoral Drift Pasture Sediment Vegetation Morainal Lake Reclamation Test Plot
1372-12083-B				

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